

- 27 -

What is claimed is:

1. An adsorbent bed comprising:
 - a) a first layer of adsorbent adapted for the removal of water;
 - b) a second layer of adsorbent comprising a mixture of adsorbents, wherein at least one component of the said mixture has a bulk density of greater than or equal to 32 lb/ft³;
 - c) a third layer of adsorbent comprising an adsorbent having a bulk density of greater than or equal to 32 lb/ft³; and
 - d) a fourth layer of adsorbent having a N₂ Henry's Law constant of greater than 1.5 mmol/g.bar.
2. The adsorbent bed of claim 1 wherein said first layer of adsorbent is selected from the groups consisting of alumina, silica gel, silicalite and zeolites; said second layer of adsorbents comprising a mixture of alumina with activated carbon or zeolite; said third layer of adsorbent comprising activated carbon.
3. The adsorbent bed of claim 1, wherein said fourth layer of adsorbent is selected from the group consisting of VSA-6, KE-H650, KE-J407, CaX(2.0), LiX(2.0) (>86% Li), LiCaX (2.0) and binderless LiX(2.0) (>86% Li), where (2.0) refers to the SiO₂/Al₂O₃ ratio.
4. The adsorbent bed of claim 1, wherein said mixture of step b) contains activated carbon that has a bulk density of at least 38 lb/ft³ and wherein fourth

- 28 -

layer of adsorbent has a N_2 Henry's Law constant of at least 2.3 mmol/g.bar.

5. The adsorbent bed of claim 1 wherein the zeolite in the second layer is X zeolite, and wherein said adsorbent bed is used for hydrogen purification.

6. A process for the purification of a gas stream containing more than 50 mole % hydrogen and impurities including water, CO_2 , CH_4 , CO and N_2 , said process comprising passing said gas stream over a bed of adsorbent, wherein said bed of adsorbent comprises at least 4 layers, the first layer selected from the group consisting of silica gel, silicalite, zeolite and alumina, the second layer of activated carbon or zeolite and alumina, the third layer of activated carbon and a fourth layer of adsorbent having a N_2 Henry's Law constant of at least 1.5 mmol/g.bar.

7. The process of claim 6, wherein the activated carbon in said second layer has a bulk density of greater than or equal to 38 lb/ft³.

8. The process of claim 6, wherein said N_2 Henry's Law constant at least 2.3 mmol/g.bar.

9. The process of claim 6 wherein said fourth layer of adsorbent is selected from the group consisting of VSA-6, KE-H650, KE-J407, CaX(2.0), LiX(2.0) (>86% Li), LiCaX (2.0) and binderless LiX(2.0) (>86% Li), where (2.0) refers to the SiO_2/Al_2O_3 ratio.

- 29 -

10. The process of claim 6 wherein the activated carbon in the second layer is an impregnated activated carbon having a bulk density of at least 32 lb/ft³